Contents

Obituary xi

International Seaweed Association Executive Council xiii

National Organizing Committee and National Sponsors xiv

Acknowledgements ..... xv–xvi

Marinalg International Awards ..... xvii–xviii

Student Paper Awards and Student Travel Awards xix

List of participants ..... xxi–xl

Presidential Address
by Mark A. Ragan, President, International Seaweed Association ..... xli–xlii

Future uses of marine algae: science, technology and economics at work
by Patricio A. Bernal, Undersecretary of State for Fisheries, Chile ..... xliii–xlv

1. Plenary lectures

Seaweed research and utilization in Chile: moving into a new phase
by Bernabé Santelices 1–14

Ethnobotany of seaweeds: clues to uses of seaweeds
by Isabella A. Abbott 15–20

Host-virus interactions in marine brown algae
by Dieter G. Müller 21–28

DNA analysis methods for recognizing species invasion: the example of *Codium*, and generally applicable methods for algae
by Annette W. Coleman 29–34

Recent developments in manufacturing and marketing carrageenan
by Harris J. Bixler 35–57

2. Special topic: Integrated aquaculture

An introduction to integrated farming and the use of seaweeds as biofilters
by Alejandro H. Buschmann 59–60

Ulva rigida (Ulvales, Chlorophyta) tank culture as biofilters for dissolved inorganic nitrogen of fishpond effluents
by Miguel Jiménez del Rio, Zayin Ramazanov and Guillermo García-Reina 61–66

Integrated cultivation of salmonids and seaweeds in open systems
by Royann J. Petrell and Sylvain Y. Alie 67–73

Integrated tank cultivation of salmonids and *Gracilaria chilensis* (Gracilariales, Rhodophyta)
by Alejandro H. Buschmann, Max Troell, Nils Kautsky and Lena Kautsky 75–82

Clean technology in aquaculture – production without waste products?
by Torjan Bodvin, Mentz Indergaard, Erik Norgaard, Arne Jensen and Arne Skaar ... 83–86

3. Special topic: Diseases in seaweeds

Diseases in seaweeds: An introduction
by Juan A. Correa 87–88

Ecological aspects of algal infectious diseases
by Juan A. Correa and Pablo A. Sánchez 89–95

Etiology of infectious diseases in cultivated *Chondrus crispus* (Gigartinales, Rhodophyta)
by James S. Craigie and Juan A. Correa 97–104

Molecular and biochemical studies of virus infections in two filamentous brown algae
by Anne-Kathrin Klebl, Martin Bräutigam, Michael Klein, Marcus Kapp, Rolf Knipper and Dieter Müller 105–110

Streblonema (Ectocarpales, Phaeophyceae) infection in the kelp *Laminaria saccharina* (Laminariales, Phaeophyceae) in the western Baltic
by Akira F. Peters and Britta Schaffelke 111–116

Factors influencing depth distribution of soft bottom inhabiting *Laminaria saccharina* (L.) Lamour.) in Kiel Bay, Western Baltic
by Britta Schaffelke, Akira F. Peters and Thorsten B.H. Reusch 117–123

4. Floristics and systematics

The molecular systematics of some agar- and carrageenan-containing marine red algae based on *rbc*L sequence analysis
by Suzanne Fredericq, Max H. Hommersand and D. Wilson Freshwater 125–135

Systematic studies of the Antarctic species of the Phyllophoraceae (Gigartinales, Rhodophyta) based on *rbc*L sequence analysis
by Suzanne Fredericq and Maria Eliana Ramírez 137–143

Approaches to the identification of terete Brazilian Gracilariaceae (Gracilariales, Rhodophyta)
by Estela M. Plastino and Eurico C. Oliveira 145–148

The species of *Ceramium* (Ceramiaceae, Rhodophyta) around Taiwan
by Jane Lewis and Chiu Mei-lan 149–157

Affinities of the marine flora of the Revillagigedo Islands, Mexico
by Hilda León-Tejera, Elisa Serviere-Zaragoza and Jorge González-González 159–168

Brown algae (Phaeophyta) from Bahía de los Angeles, Gulf of California, México
by Isaí Pacheco-Ruíz and José A. Zertuche-González 169–172

Patterns of species diversity and endemism in comparable temperate brown algal floras
by John J. Bolton 173–178

5. Population studies

Comparison of the structure of populations of *Ascophyllum nodosum* (Fucales, Phaeophyta) at sites with different harvesting histories
by Put O. Ang, Glen J. Sharp and Robert E. Semple 179–184

A comparison of reproductive allocation and reproductive effort between semelparous and iteroparous fucoids (Fucales, Phaeophyta)
by Jennie L. Brenchley, John A. Raven and Andrew M. Johnston 185–190

Seasonal variation in a low shore *Fucus serratus* (Fucales, Phaeophyta) population and its epiphytic fauna
by Gray A. Williams 191–197

Spatial variation in polyphenolic content of *Ascophyllum nodosum* (Fucales, Phaeophyta)
by Henrik Pavia and Per Åberg 199–203

Micropopulation differentiation in phenol content and susceptibility to herbivory in the Chilean kelp *Lessonia nigrescens* (Phaeophyta: Laminariales)
by Enrique Martínez 205–211

Surveys of *Undaria pinnatifida* (Laminariales, Phaeophyta) in Golfo Nuevo, Argentina
by Graciela N. Casas and María Luz Piriz 213–215

Undaria pinnatifida (Laminariales, Phaeophyta) 12 years after its introduction into the Atlantic Ocean
by Jean-Yves Floc'h, Régis Pajot and Véronique Mouret 217–222

Fecundity, spore recruitment and size in *Gelidium sesquipedale* (Gelidiales, Rhodophyta)
by Rui Santos and Pedro Duarte 223–228

Organellar DNA restriction fragment length polymorphism (RFLP) and nuclear random amplified polymorphic DNA (RAPD) analyses of morphotypes of *Gracilaria* (Gracilariales, Rhodophyta) from Chile
by Mariela González, Rolando Montoya, Arturo Candia, Patricia Gómez and Manuel Cisternas 229–234

Recruitment of *Eucheuma* and *Kappaphycus* on a farm in Tawi-Tawi, Philippines
by Rhodora Azanza-Corrales, Tehane T. Aliaza and Nemesio E. Montaño 235–244

Biological basis for the management of "luga negra" (*Sarcothalia crispata*, Gigartinales, Rhodophyta) in southern Chile
by Marcela Avila, Ricardo Otaíza, Ricardo Norambuena and Mario Nuñez 245–252

Phenology of *Gigartina skottsbergii* (Gigartinaceae, Rhodophyta) in Ancud Bay, southern Chile
by Jaime Zamarano P. and Renato Westermeier H. 253–258

The relationship between stand biomass and frond density in the clonal alga *Mazzaella cornucopiae* (Rhodophyta, Gigartinaceae)
by Ricardo Scrosati 259–265

Summer biomass of a population of *Iridaea cordata* (Gigartinaceae, Rhodophyta) from Antarctica
by Mario Cormaci, Giovanni Furnari, Blasco Scammacca and Giuseppina Alongi 267–272

Modeling competition between *Laurencia obtusa* (Ceramiales, Rhodophyta) and *Hypnea spinella* (Gigartinales, Rhodophyta) at Cabo Frio Island, Rio de Janeiro, Brazil
by Mariana A. Guimaraens, Carlos Alberto Coimbra and Ricardo Coutinho 273–276

Reproductive biology of *Stictosiphonia hookeri* (Rhodomelaceae, Rhodophyta) from Argentina, Chile, South Africa and Australia in laboratory culture
by John A. West, Giuseppe Z. Zuccarello and Ulf Karsten 277–282

6. Community studies

Benthic microalgae: comparison of chlorphyll a in mesocosms and field sites
by Gary A. Kendrick, Charles A. Jacoby and Dennis Heinemann 283–289

7. Pollution

The effect of localised eutrophication on competition between *Ulva lactuca* (Ulvaceae, Chlorophyta) and a commercial resource of *Gracilaria verrucosa* (Gracilariaceae, Rhodophyta)
by Robert J. Anderson, Pedro M.S. Monteiro and Graham J. Levitt 291–296

Improvement of the shallow water communities following reductions of industrial outlets and sewage discharge in the Hvaler estuary, Norway
by Tor L. Bokn, Frithjof E. Moy and Mats Walday 297–304

Long-term changes in heavy metal loadings of *Ascophyllum nodosum* from the Firth of Clyde, U.K.
by Fergus J. Molloy and Jeremy M. Hill 305–310

Recolonization and restoration of upper intertidal *Fucus gardneri* (Fucales, Phaeophyta) following the *Exxon Valdez* oil spill
by Michael S. Stekoll and Larry Deysher 311–316

New method for toxicity assessment in marine and brackish environments using the macroalga *Gracilaria tenuistipitata* (Gracilariales, Rhodophyta)
by Kurt Haglund, Marie Björklund, Sara Gunnare, Anneli Sandberg, Ulf Olander and Marianne Pedersen 317–325

The use of seaweeds as bioindicators of natural and anthropogenic contaminants in northern Chile
by Julio A. Vasquez and Nelson Guerra 327–333

8. Cultivation

Chrondrus crispus (Gigartinaceae, Rhodophyta) tank cultivation: optimizing carbon input by a fixed pH and use of a salt water well
by Jean-Paul Braud and Mireille A. Amat 335–340

Agar yield and quality of *Gracilaria chilensis* (Gigartinales, Rhodophyta) in tank cultures using fish effluents
by Leonel Martinez and Alejandro Buschmann 341–345

Studies on *Gracilaria changii* (Gracilariales, Rhodophyta) from Malaysian mangroves
by Siew-Moi Phang, Shafeei Shaharuddin, Hashim Noraishah and A. Sasekumar 347–352

Experimental tank cultivation of *Gracilaria* sp. (Gracilariales, Rhodophyta) in Ecuador
by Magdalena Salazar O. 353–354

Gracilaria-Mytilus interaction on a commercial algal farm in Chile
by Claudia A. Retamales and Alejandro H. Buschmann 355–359

Vegetative propagation of *Gelidium sclerophyllum* (Gelidiales, Rhodophyta) by fragmentation
by Dení Rodríguez 361–365

Practical and descriptive techniques for *Gelidium rex* (Gelidiales, Rhodophyta) culture
by Ramiro Rojas H., Nelson León M. and Ramiro Rojas O. 367–370

9. Economics

Recent trends in seaweed production in Chile
by Ricardo Norambuena 371–379

Feasibility for establishing a carrageenan industry in Mexico
by José A. Zertuche-González 381–386

10. Physiology, biochemistry and cell biology

Fusion and histocompatibility in Rhodophyta
by Paloma González and Juan A. Correa 387–392

Effects of auxins and cytokinins on tissue culture of *Grateloupia dichotoma* (Gigartinales, Rhodophyta)
by Nair S. Yokoya and Walter Handro 393–400

Inorganic carbon acquisition by red seaweeds grown under dynamic light regimes
by Janet E. Kübler and John A. Raven 401–406

Xanthophyll-cycle and photosynthetic adaptation to environment in macro- and microalgae
by Nour-Eddine Rmiki, Christophe Brunet, Jacqueline Cabioch and Yves Lemoine .. 407–413

Acclimation to UV irradiance in *Gracilaria cornea* (Gracilariaceae, Rhodophyta)
by Ximena Molina and Vivian Montecino 415–420

Intercellular assimilate translocation in *Gracilaria cornea* (Gracilariaceae, Rhodophyta)
by Yael Gonen, Eitan Kimmel, Elisha Tel-Or and Michael Friedlander 421–428

Nuclear-encoded protein-coding genes of the agarophyte *Gracilaria verrucosa* (Gracilariales, Rhodophyta)
by Yi-Hong Zhou and Mark A. Ragan 429–436

The effect of phosphate concentration on growth and agar content of *Gelidium robustum* (Gelidiaceae, Rhodophyta) in culture
by Isabel Sousa-Pinto, Ray Lewis and Miriam Polne-Fuller 437–443

Nitrogen and phosphorus uptake by the Brazilian kelp *Laminaria abyssalis* (Phaeophyta) in culture
by Adriana dã Costa Braga and Yocie Yoneshigue-Valentin 445–450

Accumulation, effects on growth and localization of zinc in *Padina gymnospora* (Dictyotales, Phaeophyceae)
by Gilberto M. Amado Filho, Claudia S. Karez, Wolfgang C. Pfeiffer, Yocie Yoneshigue-Valentin and Marcos Farina 451–456

Dynamics of antibacterial activity in three species of Caribbean marine algae as a function of habitat and life history
by Pedro O. Robles-Centeno, David L. Ballantine and William H. Gerwick 457–462

Application of airborne imaging spectrometry system data to intertidal seaweed classification and mapping
by Touria Bajjouk, Brigitte Guillaumont and Jacques Populus 463–471

11. Chemistry and chemical composition

Chemical characterisation and gelling properties of cell wall polysaccharides from species of *Ulva* (Ulvales, Chlorophyta)
by Marc Lahaye, Bimalendu Ray, Stéphanie Baumberger, Bernard Quemener and Monique A.V. Axelos 473–480

Vibrational spectroscopy of seaweed galactans
by Betty Matsuhiro 481–489

The acidic polysaccharide from *Palmaria decipiens* (Palmariales, Rhodophyta)
by Betty Matsuhiro and Carlos C. Urzúa 491–495

Structure and properties of agar from two unexploited agarophytes from Venezuela
by Erminio Murano, Renato Toffanin, Cristiano Pedersini, Alfredo Carabot-Cuervo, Gerald Blunden and Roberto Rizzo 497–500

Temporal and spatial variation in agar from a population of *Pterocladia capillacea* (Gelidiales, Rhodophyta) from Brazil
by Eurico C. Oliveira, Rosa M. Saito, Jose F. Santos Neto and Gracinda M.C. Garófalo 501–504

A polysaccharide fraction from the red seaweed *Champia novae-zealandiae* (Rhodymeniales, Rhodophyta)
by Ian J. Miller, Ruth Falshaw and Richard H. Furneaux 505–509

Seasonal variations in sterol composition of *Delesseria sanguinea* (Ceramiales, Rhodophyta)
by Samira Nabil and Joël Cosson 511–514

Changes in M:G ratios of extracted and residual alginate fractions on boiling with water of the brown alga *Kjellmaniella crassifolia* (Laminariales, Phaeophyta)
by Eiichi Nishide, Hirosi Anzai, Naoyuki Uchida and Kazutosi Nisizawa 515–518

Subject index 519–522

Chemical components index 523–524

Taxonomic index 525–531

Author index 533–534